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ABSTRACT

This document is the instructor's manual for the learning module, "Teaching the Concept of Area." It contains a list of materials needed for a resource center and materials needed by students; a list of books for a curriculum library; directions for the instructor; and a response key for the diagnostic pre-assessment test. Response manual and student manual available separately. (MB)

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A MODULE APPROACH

INTEGRATING CONTENT, METHOD, AND FIELD EXPERIENCE

INSTRUCTOR'S MANUAL
TEACHING THE CONCEPT OF AREA

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Description

This module unit, an individualized instructional approach which allows the student to acquire the competencies needed to teach one specific topic in mathematics, was developed primarily for use in a competency-based teacher-education program. The sections of the module in this unit, designed for the preparation of pre-service and in-service elementary school teachers, integrates the content, method and field experience components related to teaching the mathematical concept of area. The study of area was chosen because it is rich in practical applications and is particularly significant as a building block for future mathmatical study.

In this module approach, the teacher trainee learns mathematics in a laboratory environment, is involved in a variety of learning and teaching strategies, and gains experience in selecting and implementing appropriate child-centered activities. For this unit to be implemented, certain resources are needed. These include a curriculum library, a mathematics laboratory, and available groups of ten- to twelve-year-old children with whom the teacher trainee can work. A list of the specific materials needed in the mathematics laboratory and curriculum library is included in this manual. Since the teacher trainee will be primarily working in the curriculum library and mathematics laboratory in order to complete this module, a resource person should be continuously available for consultation.

The overview introduces the teacher trainee to the module program, and indicates the purpose of the module, the specific competencies, and the assessment procedures designed to guide him through the program.

The instructor's role in this unit consists of analyzing the pre-assessment, participating in the mathematics laboratory and curriculum library for preparation of the program materials and for student guidance, evaluating the teacher trainee's sequence of learning tasks in Section II, helping the trainee select a sequence to present in Section III to a group of children, evaluating the teacher trainee's field experience product, and analyzing the teacher trainee's assessment of his field experience.

SPECIFIC MATERIALS NEEDED FOR RESOURCE CENTER

Mathematics Laboratory

Films: "Dance Square"
Piaget's film on "Conservation"
Pattern Blocks (Include parallelogram, hexagon, etc.)
Cuisenaire Rods
Geoboards
Geometric Models (Solids: Rectangular, Cylindrical, Spherical)
Model of Liquid Area of a Circle
Tangram Pieces
Tangram Activity Cards

Additional Materials Need by the Student

Dot Paper
Graph Paper
Index Cards - 3 x 5
Tracing Paper
Scissors
Ruler (Metric and Inch)
Unlined Paper
Scotch Tape
Lima Beans
Postage Stamp - 10¢ size

Curriculum Library

Edith Biggs, Freedom to Learn, Addison Wesley, 1969.

Ward Bouwsma, Geometry for Teachers, Macmillan, 1972.

Richard Copeland, Mathematics and the Elementary Teacher, Saunders, 1972.

Alex Crowder and Olive Wheeler, Elementary School Mathematics Methods and Materials, W.C. Brown Co., 1972.

John J. Del Grande, Geoboards and Motion Geometry, Scott Foresman, 1972.

Elementary Science Study, Tangrams, McGraw-Hill, Webster Division, 1968.

Elliott, et al., Geometry in the Classroom, Holt, Rinehart & Winston, 1968.

Fitzgerald, et al., Laboratory Manual for Elementary Mathematics, Second Edition, Prindle, Weber and Schmidt, 1973.

John Ginther, Math Experiments with the Tangram, Midwest Publications Co., 1972.

Joseph Hooten and Michael Mahaffey, Elementary Mathematics Laboratory Experience, Charles Merrill, 1973.

Jenkins and McLean, Its a Tangram World, Mathematics Workshop, 1970.

Johnson et al., Applications in Mathematics, Course A, Scott Forseman, 1973.

M. Keedy and C. Nelson, Geometry, a Modern Approach, Second Edition, Addison Wesley, 1965.

Kenneth Lovell, Growth of Understanding in Mathematics, Holt, Rinehart and Winston, 1971.

Josephine Mold, Tessellations, Cambridge University Press, 1969.

Nuffield Mathematics Project, Shape and Size, Books 2, 3, 4, John Wiley and Sons, 1968-1972.

Nuffield Mathematics Projects, Problems, Red Set and Green Set, John Wiley and Sons, 1968-1972.

Pearcy and Lewis, Experiments in Mathematics, Stages 1, 2, 3, Houghton Mifflin Co., 1967.

J. Piaget, Cogitive-Development Research and Mathematical Education. National Council Teachers of Mathematics, 1970.

Readings in Geometry, Arithmetic Teacher, National Council Teachers of Mathematics, 1970.

L. Ringenberg, Informal Geometry, John Wiley, 1966.

Sadlier, Contemporary Mathematics 7, Teacher's Guide, Sadlier, 1970.

W.W. Sawyer, Visions in Elementary Mathematics, Penguin, 1964.

Dale Seymour, Tangramath, Creative Publications, 1970.

School Mathematics Project, Book A, Book B, Book C, Book D, Book E, Book F, Cambridge at the University Press, 1971.

School Mathematics Study Group, Volume V, Volume IX, 1962.

UICSM, Motion Geometry, Book IV, Harper Row, 1969.

John Young and Grace Bush, Geometry for the Elementary Teacher, Holden-Day, 1971.

**Mathematics Textbooks for Grades Five and Six and the Teacher's Guides should also be available for the students.

Section I

The Instructor is to score the Diagnostic Pre-Assessment Test. The response key for the test is included in this manual. On the last page of the test, there is a table for convenience in scoring. Place a check in the appropriate box. The teacher trainee needs this scoring information in order to know which activities he must complete in Section I.

When you have scored the Diagnostic Pre-Assessment Test, return the paper to the teacher trainee. Inform him to use the Decision Rules in his manual on page 00.

The teacher trainee's manual has responses to all tasks in each activity with the exception of the Post-Assessment Tasks. The Post-Assessment Tasks responses are included in the Response Manual.

Section II

In Section II, the instructor evaluates the teacher trainee's sequence of learning tasks developed in Activities A through D. A criteria for this evaluation is provided below. As you deem each of the sequences of learning tasks developed by the teacher trainee in Activities A through C satisfactory, direct the teacher trainee to continue following the Decision Rules in his manual on page 00. When you deem the responses to Task D-1 and the sequence of learning tasks developed by the teacher trainee in Activity D satisfactory, direct the teacher trainee to begin Section III.

Criteria for Evaluation of Sequence of Learning Tasks

A. Check list - the checklist will determine if the student has included all the component parts for the sequence of learning tasks. This checklist is also completed by the student.

	Yes	No
1. Did you state your objective?		
2. Do you have a specific learning task for each of the enabling objectives?		
3. Does each learning tasks state what the student is given to work with?		
4. Does each task state what the student will be required to do?		
5. Have you stated what the student will record in order that you might assess his learning experience?		

B. Instructor's Criteria - this criteria related to the instructor's own evaluation of the following:

1. teaching-learning strategies utilized

2. appropriateness of content for 10 to 12 year olds (including depth of content)

3. evidence of student learning

4. achievement of stated objectives

Section III

In this section, the instructor will select one of the four sequences of learning tasks that the teacher trainee prepared in Section II and will

1. Assign the teacher trainee to a group of ten- to twelve-year-old students to whom he will present the selected sequence of learning tasks as a mini-lesson.

2. Provide the teacher trainee with criteria for the assessment of the presentation of his sequence of learning tasks. The criteria for the student's assessment must be established by the instructor dependent upon the major aspect of the sequence of learning tasks that the teacher trainee uses in his mini-lesson presentation.

3. Inform the teacher trainee of what kinds of "evidence" (videotapes, children's worksheets, etc.) you will require him to present as part of his assessment.

4. Assess the teacher trainee's field experience and determine if the student must repeat the field experience or if he may exit the module. This assessment is based entirely on the instructor's criteria.

Response Key for Diagnostic Pre-Assessment Test

1. Answers will vary, but it is expected that the student's explanation will indicate that the area of a region is found by considering the number of congruent units that are needed to cover the region.

2. All the figures tessellate.

3. 132 square inches

4. c

5. The area of a plane region remains invariant through the operations of dissecting or reassembling the pieces of the plane region into different shaped regions.

6. Area = $\frac{1}{2}$ (2a) (b +4)

7. See solution to Task 5.4 in Section I , page 110.

8. See Post-Assessment Task for Element VI, Task II, for discussion of possible responses.

9. 42 square centimeters

10. Approximately 2.1 quarts